

Internal architecture and external geometry of sediment waves offshore Senegal

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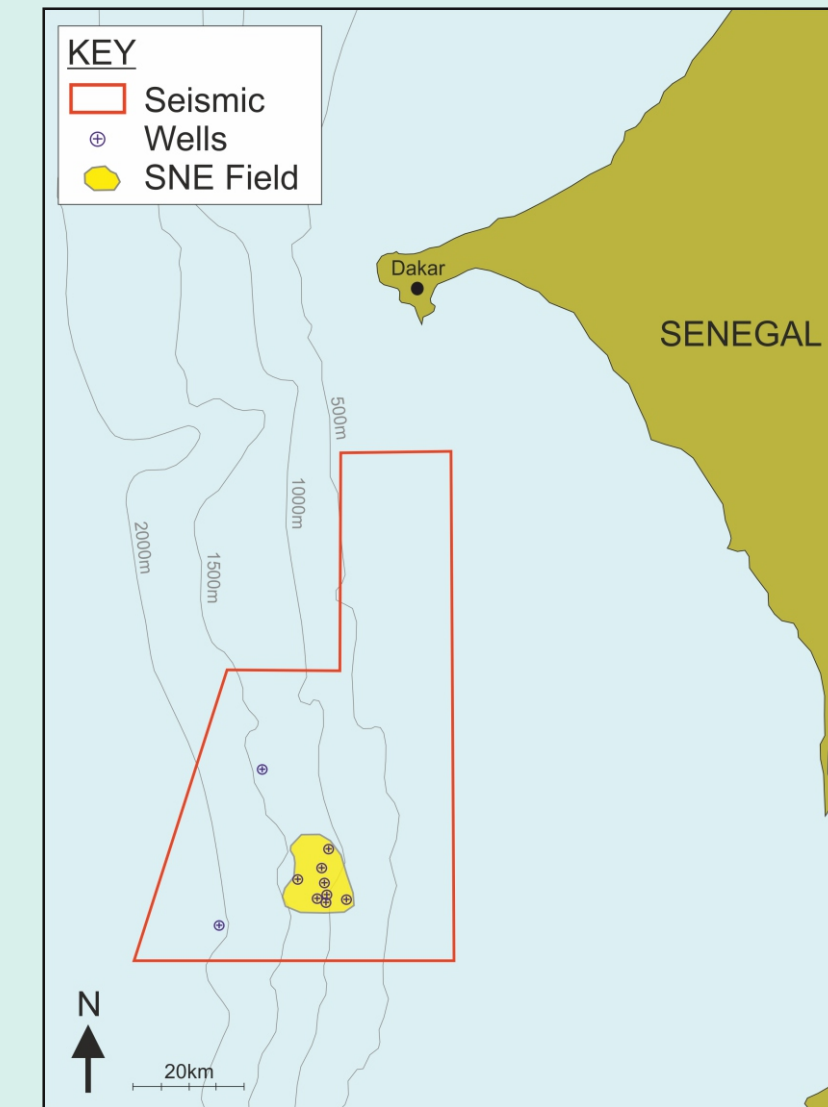
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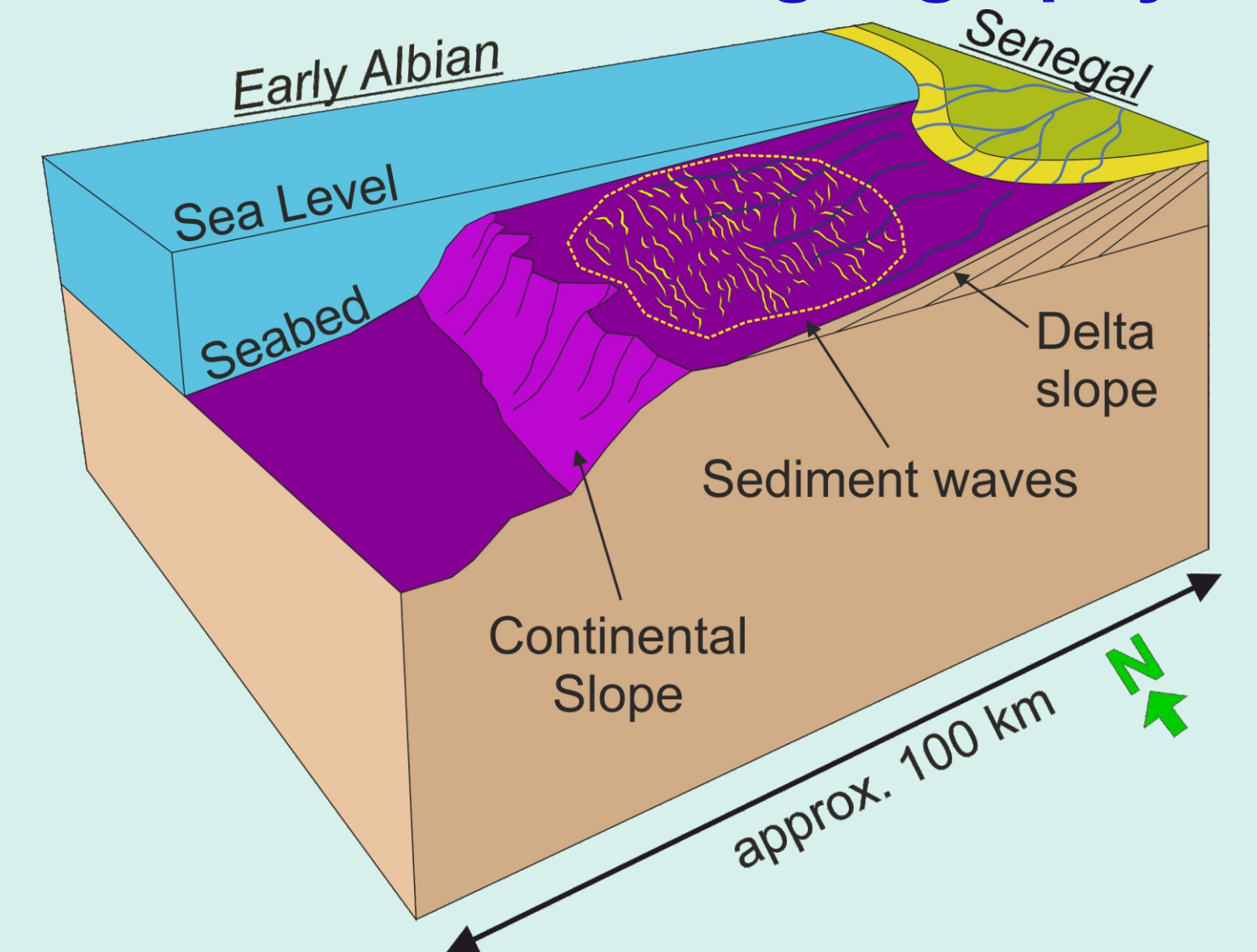
1. Introduction

- This project aims to better understand the extent and character of the sediment waves present in the SNE petroleum field, offshore Senegal, West Africa.
- Discovered by Cairn Energy and partners in 2014, the field has since been appraised by a further seven wells. An extensive 3D seismic survey, four reservoir cores and a suite of well logs form the main data set.
- The sediment waves exist in two reservoir intervals; Unit 1 and Unit 2. They are believed to be early Albian in age and deposited in a pro-delta environment. Estimated water depth was between 300-900m.

Data Map

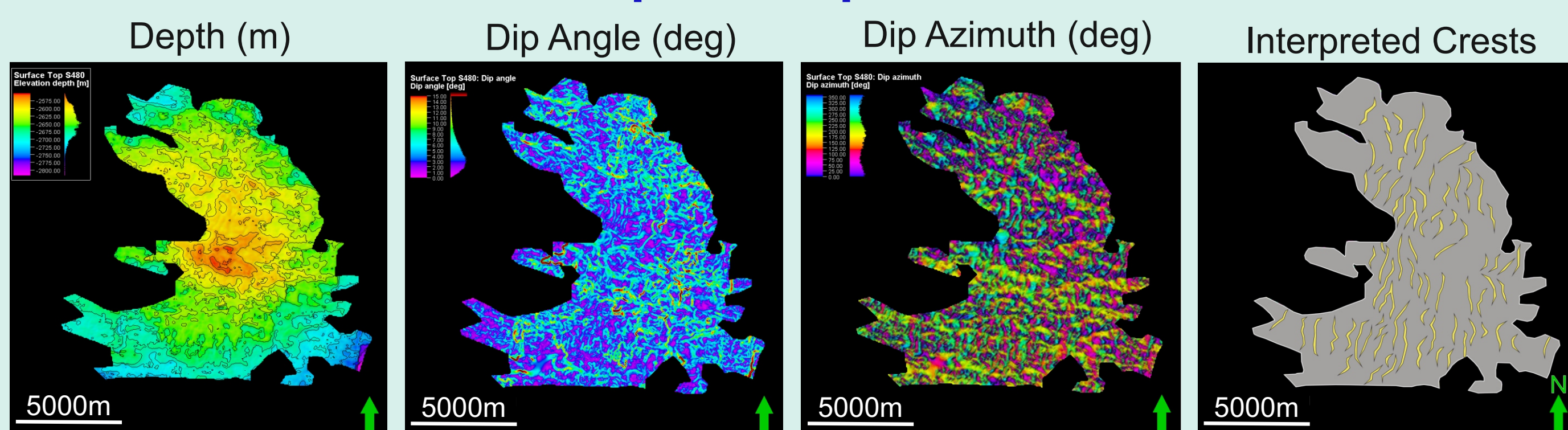


Schematic Palaeogeography



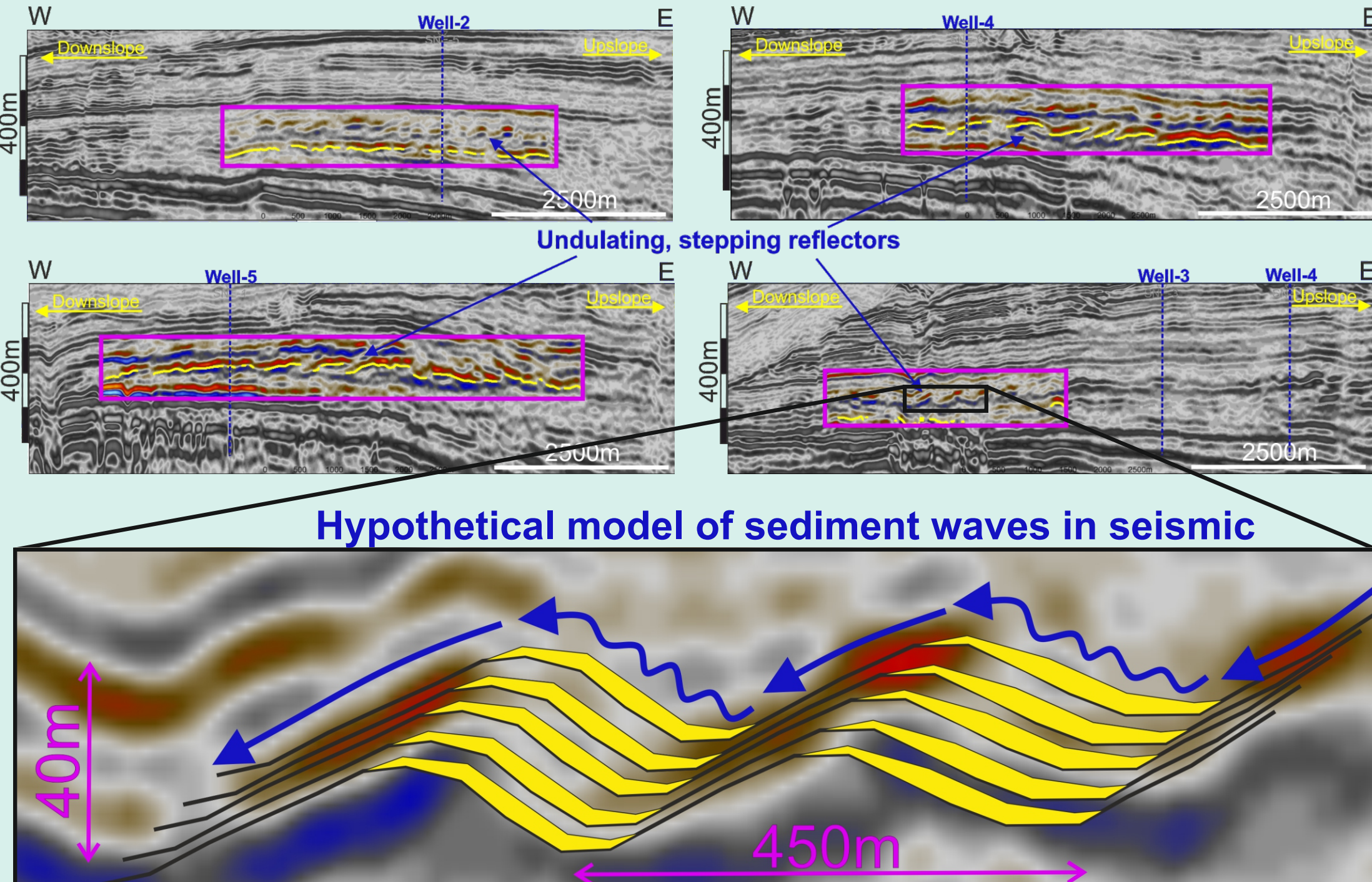
3. Petroleum Data

Seismic Maps of Top Unit 2 Surface



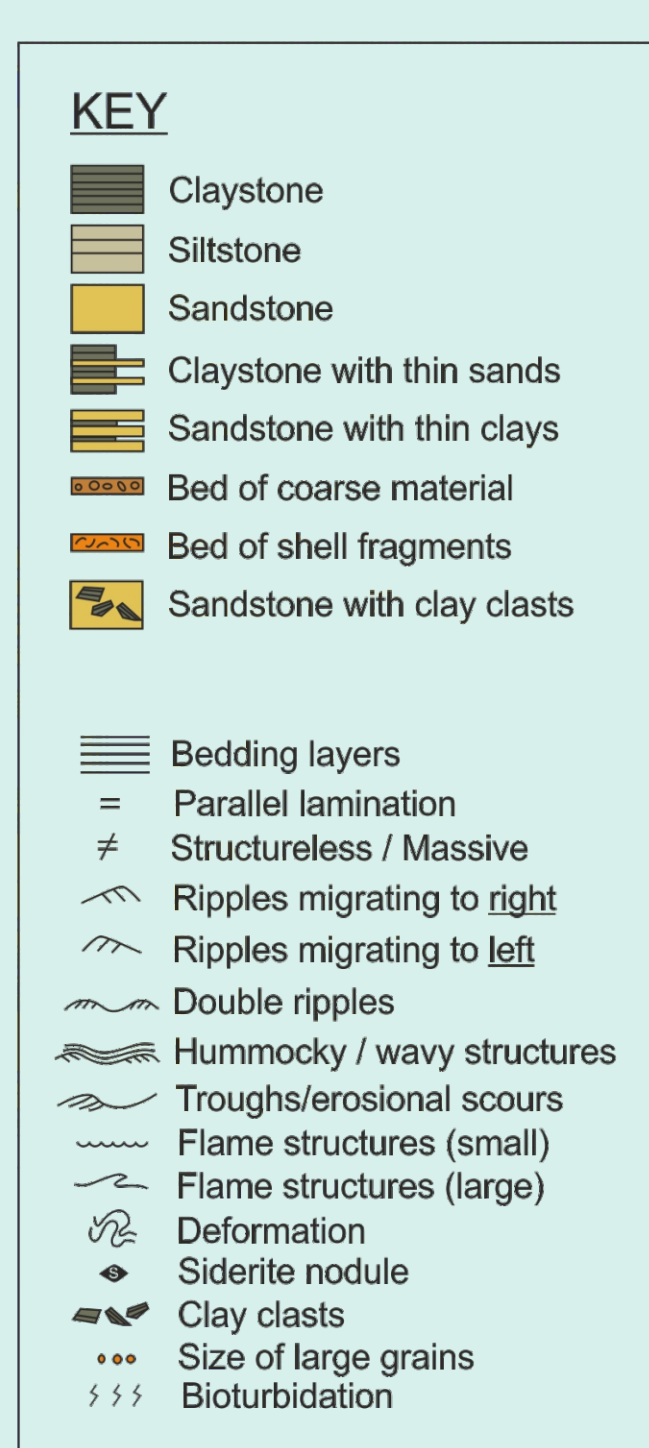
WELL-1

Seismic Cross Sections



Core Findings

- Very fine sand is dominant grain size
 - Bouma sequences Tb-Te
 - Ripples and parallel lamination
 - Probable amalgated surfaces
 - Occasional mud clasts and shelly fragments
 - Bioturbation in 'burned down tops'
 - Variation in ripple direction and ripple types
- ➔ Deposited by **turbidity flow** events which may be influenced by existing bathymetry



2. Research Questions

- How can sediment waves be identified in a petroleum dataset?
- What was the depositional process of the SNE waves?
- What analogues are available to aid understanding?
- What can we learn about the geometry and architecture of sediment waves?
- How can we model the impact of sediment wave architecture on fluid flow?

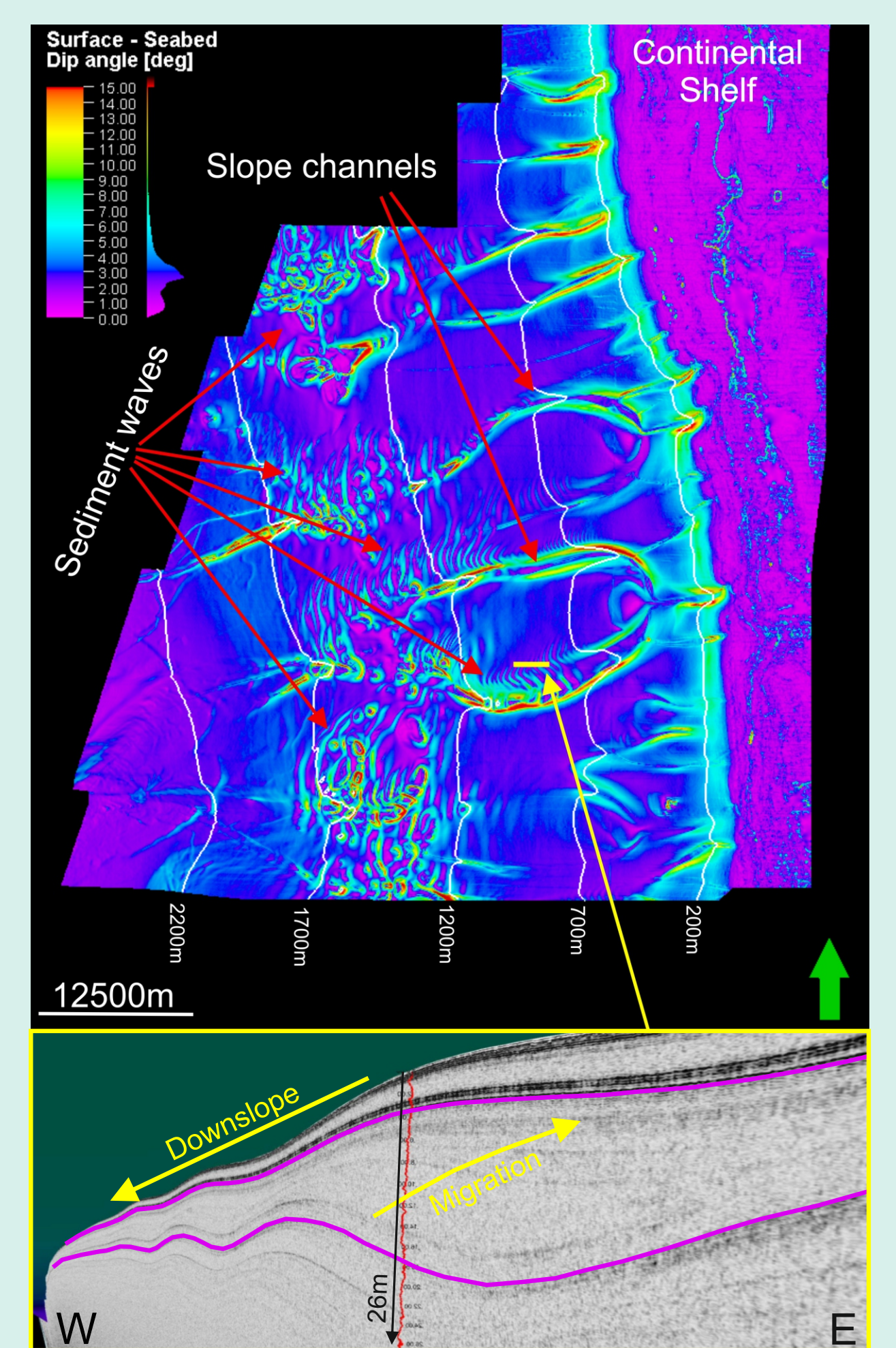
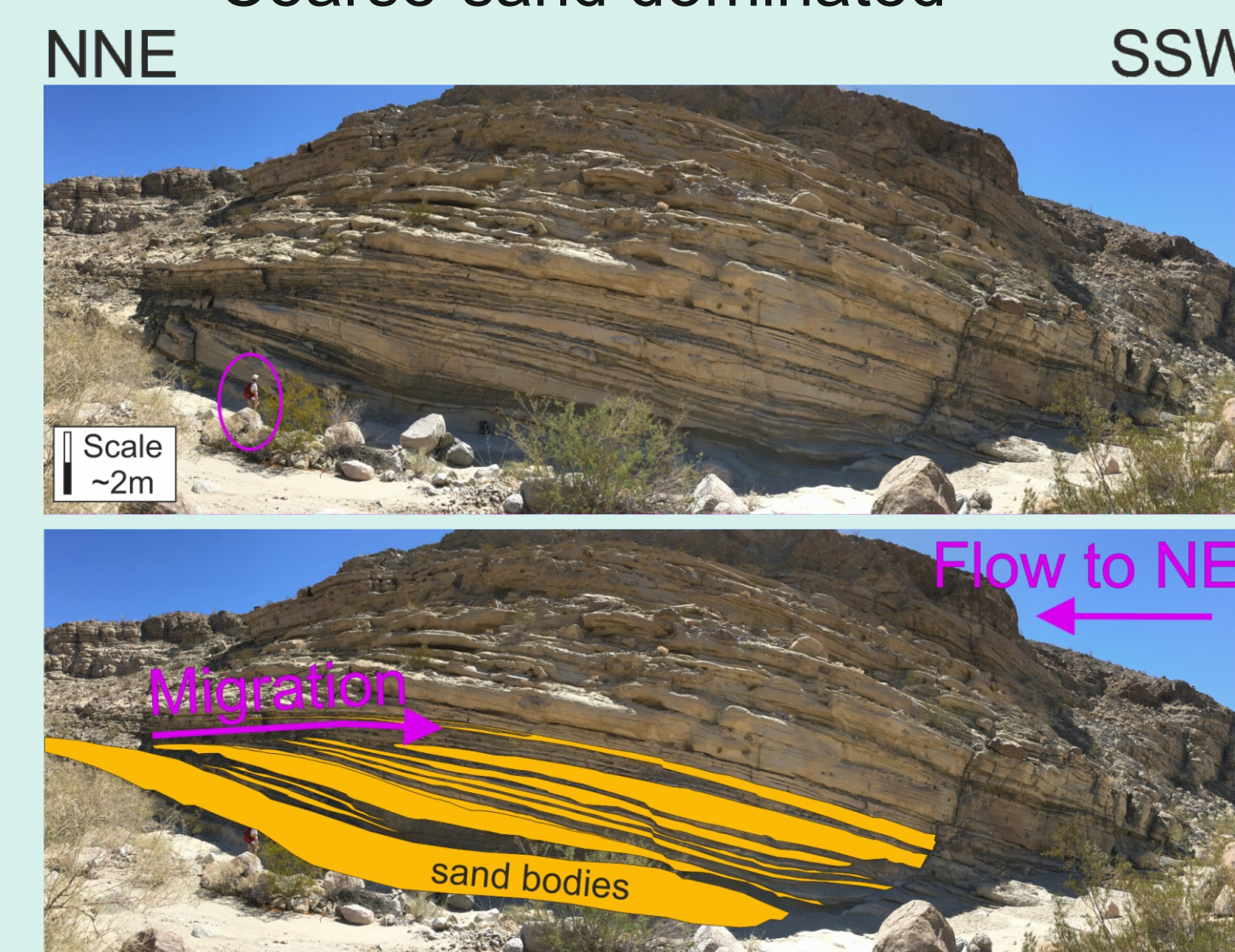
4. Analogues

Modern-day Seabed

- Examples of sediment wave geometries and architecture
- Utilise 3D seismic, high-frequency 'sparker' shallow 2D seismic lines and seabed cores

Outcrop

- Upper Miocene turbidites
- Anza-Borrego, South California
- Subtle antidune bedforms migrating against palaeo-flow
- Similar to SNE core except
 - Bouma Ta frequent
 - Coarse-sand dominated



5. Future Work

- Detailed analysis of seismic at reservoir and regional scale
- Analysis of dip log to interpret stoss and lee-sides of waves
- Interpretation of sediment waves on modern-day seabed
- Test methods of reservoir modelling